THE VASCULAR FLORA OF GALVESTON ISLAND STATE PARK, GALVESTON COUNTY, TEXAS, U.S.A.

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ABSTRACT

Galveston Island State Park is located near the center of Galveston Island in Galveston County, Texas, U.S.A. The 789.1 ha park lies within the Western Gulf Coastal Plain ecoregion. A floristic survey was conducted from July 2011 through November 2013, and vouchered specimens at TEX collected in the early 70s by R.J. Fleetwood verified, with the goal of assembling an annotated checklist of vascular plants. This resulted in a checklist of 317 species of vascular plants representing 68 families and 221 genera. The largest families were Poaceae (65 spp.), Asteraceae (36 spp.), Fabaceae (25 spp.), Cyperaceae (24 spp.), and Amaranthaceae (11 spp.). Non-native species account for 16.4% of the total flora. Seven species in six different families are of conservation interest in that they are endemic to the ecoregion. Lists of species characteristic of readily recognizable habitat types are provided.

RESUMEN

El Galveston Island State Park está localizado cerca del centro de la isla Galveston en el condado de Galveston, Texas, U.S.A. Es parque de 789.1 ha está en la ecoregión de Western Gulf Coastal Plain. Se realizó un estudio floristico de julio de 2011 a noviembre de 2013, y se verificaron especimenes testigo en TEX collectados a principios de los 70 por R.J. Fleetwood, con el objetivo de realizar un catálogo anotado de plantas vasculares. Así se obtuvo una catálogo de 317 especies de plantas vasculares que representan 68 familias y 221 géneros. Las familias más numerosas fueron Poaceae (65 spp.), Asteraceae (36 spp.), Fabaceae (25 spp.), Cyperaceae (24 spp.), y Amaranthaceae (11 spp.). Las especies no nativas fueron el 16.4% de la flora total. Siete especies de seis diferentes familias son de interés para la conservación ya que son endémicas de la ecoregión. Lists of species characteristic of readily recognizable habitat types are provided.

INTRODUCTION

Galveston Island State Park is located near the center of Galveston Island, one of a series of barrier islands and bay/lagoon systems separating most of the Texas mainland from the Gulf of Mexico (Fig. 1). The Texas coast comprises most of the area designated by Griffith et al. (2004) as the Western Gulf Coastal Plain ecoregion. The 789.1 ha (1,950 acre) park straddles the Island from the Gulf to West Galveston Bay and is roughly square in overall dimensions (Fig. 2). Galveston Island's formation is recent, beginning as a submerged offshore bar no more than 4,500 to 5,000 years ago that accumulated until about 1900 when it reached its maximum width (Garner 1997). The bayside region consists of salt marsh fringing a series of peninsulas and intervening lagoons perpendicular to the Island's long axis (Fig. 2). A series of dune ridges and swales parallel the Island's long axis from its center to the beach (Fig. 2). These formed as the Island accreted seaward and became too wide and high for significant wash-over events. The ridges and swales support prairie and freshwater wetlands respectively. All of these features are well represented in the park.

Galveston Island has been narrowing through erosion and apparent sea level rise since approximately 1900. This is due to several factors including the construction of jetties at the mouth of Galveston Bay which block the longshore drift and sand supply to the island's beaches, subsidence of the Island from subsurface fluid withdrawal, and eustatic sea level rise (Raven et al. 2009). Since the park's establishment in 1972, its beach has moved inland approximately 74.1 m (243 feet; Sipocz 2010). The active dune system has been completely displaced since the park's establishment and now overlies what had previously been wetlands or developed facilities (Sipocz 2010).

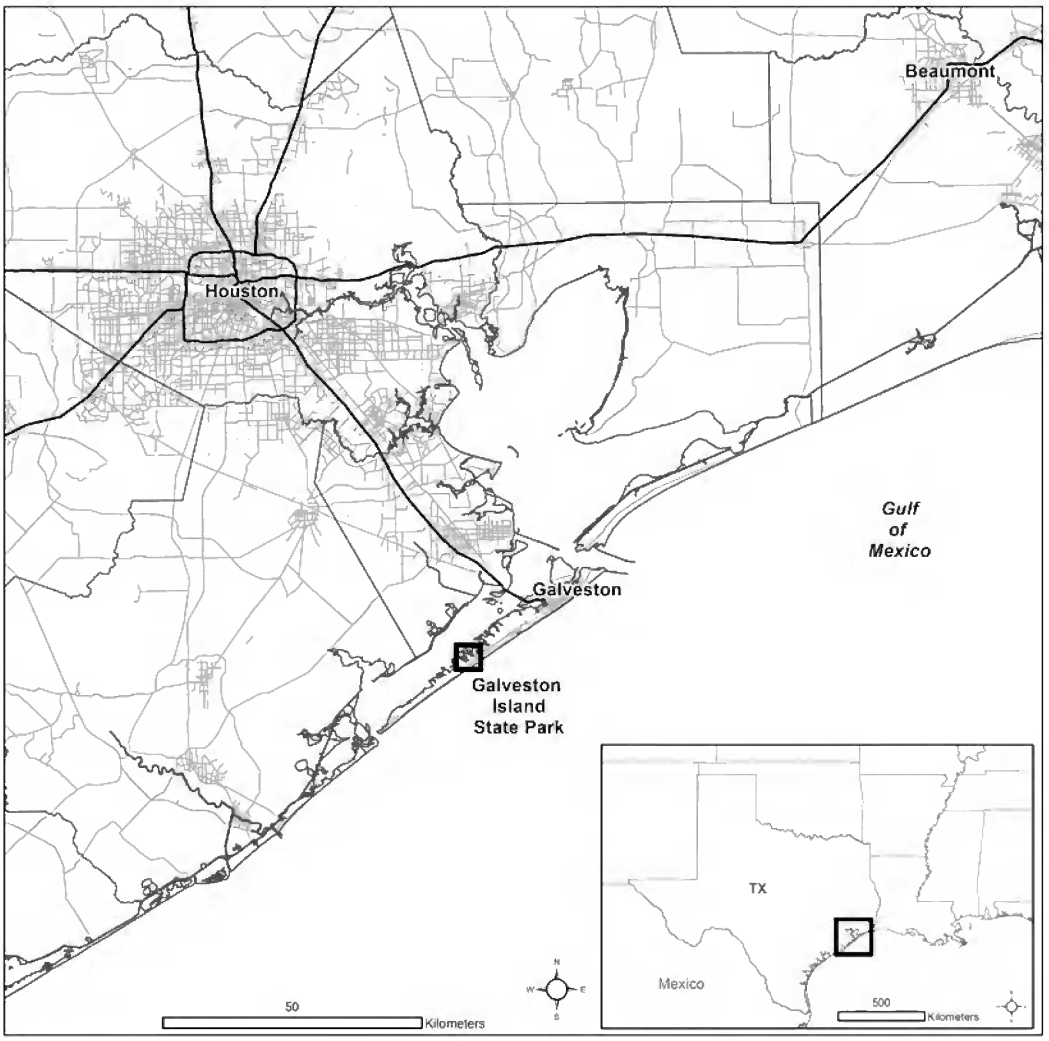

Fig. 1. General location of Galveston Island State Park, Galveston County, Texas.

Climate

Galveston Island occurs within a humid, warm-temperate to marginally subtropical region receiving an average of 129 cm (51 in) of rainfall annually (Britton & Morton 1989; National Weather Service 2013). The average temperature for Galveston Island is 21.8°C (71.2°F), with August being the warmest month (29°C, 85°F) and January the coldest (12.9°C, 55.2°F; National Weather Service 2013). The cooling effect of sea-breezes from the Gulf of Mexico moderates summer temperatures (Crenwelge et al. 1988). The predominant wind direction is southeast, but varies by season. The light southerly winds predominate in spring through early fall, while cold fronts with strong northerly winds that push water out of the bay punctuate the winter. Tropical storms and hurricanes are frequent on the Texas coast, striking with a frequency of 0.67 storms per year (Hollingsworth 1998).

Soils and Vegetation

Four different soil series occur at Galveston Island State Park, and all are derived from the inland deposition of

Fig. 2. True-color aerial photograph of Galveston Island State Park (outlined in green), Galveston County, Texas.

beach sands (Fig. 3; Crenwelge et al. 1988). The Karankawa Mucky Loam Series is a bayside salt marsh soil formed on over-wash-deposited sands with a high amount of partially decayed organic matter resulting from plant growth coupled with anaerobic soil conditions (Crenwelge et al. 1988).

Prominent dune ridges in the interior of the park consist of Galveston Loamy Fine Sand and Galveston Fine Sand Series soils (Fig. 3). These are wind accumulated, mildly alkaline, somewhat excessively drained soils that are very rapidly permeable with fine sand in the upper 183 cm (72 in) to 356 cm (140 in) and support prairie vegetation (Crenwelge et al. 1988). Upland prairie on Texas' barrier islands is regionally referred to as "strand prairie" (Hollingsworth 1998). We are uncertain as to the origin of this seemingly colloquial name, but it is clear that Hollingsworth (1998) used it to refer to *Schizachyrium littorale* (Nash) E.P. Bicknell- *Paspalum monostachyum* dominated grasslands of Texas' barrier islands and Coastal Sand Plain (Diamond et al. 1987). This community is considered an ally of coastal prairie marked by tolerance of occasional tidal over-wash, and probably more importantly, the salt spray typical of the spring through fall months which produces measur-

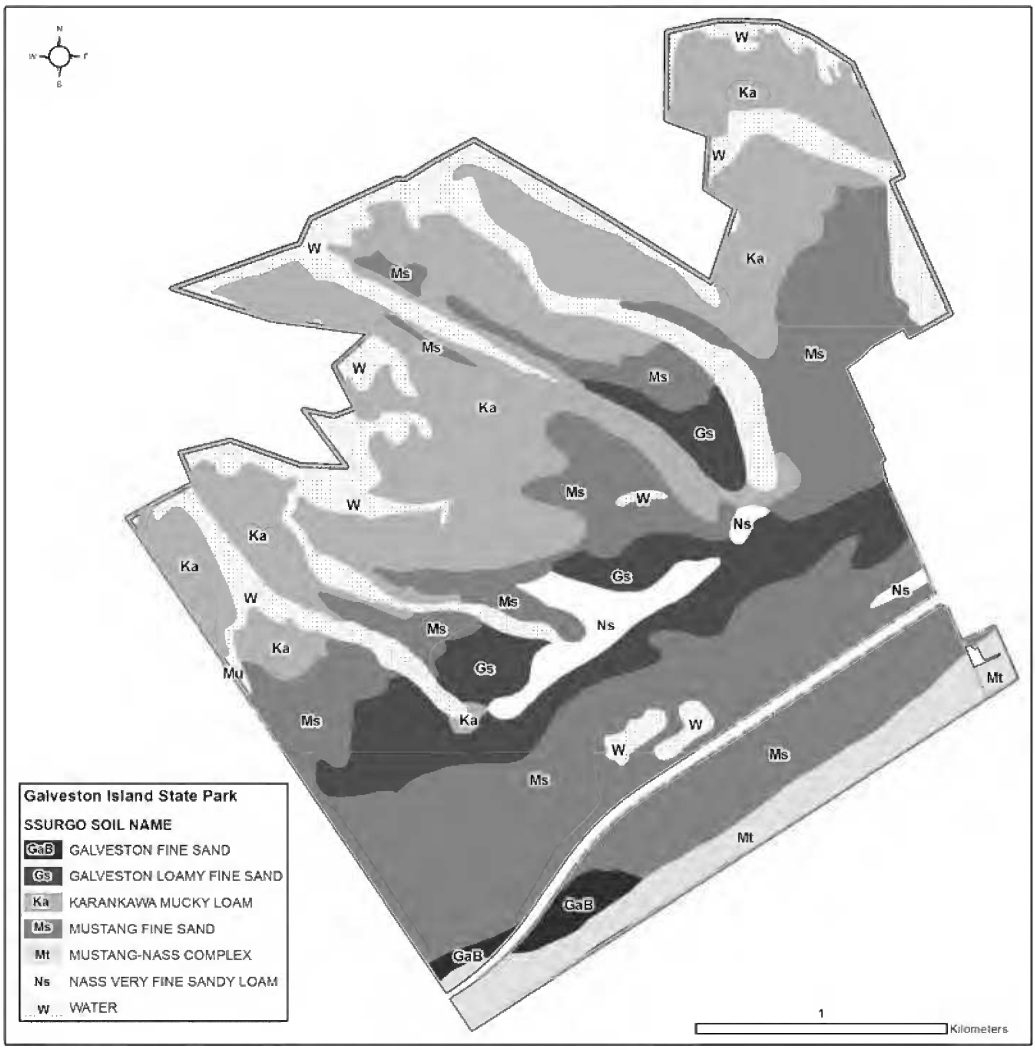

Fig. 3. Map of major soil series of Galveston Island State Park, Galveston County, Texas.

able soil salinity throughout the park and accumulates on plant surfaces during dry periods. The Galveston Loamy Fine Sand Series is uniquely underlain by a shell layer and portions of it support live oak (*Quercus virginiana*) woodlands known colloquially as "live oak mottes." Just east of the park, a live oak motte on this soil type contains an extensive Native American burial ground which was described by early Spanish explorers indicating that the presence of trees on the Island predates European settlement (Ricklis et al. 1994). The Galveston Fine Sand Series also supports strand prairie but is treeless, not underlain by shell fragments, and lies closer to the beach.

The majority of the terrestrial park lands consist of the Mustang Fine Sand Series. This strongly alkaline, somewhat poorly drained, very slowly permeable soil occurs on flats or slightly convex or concave surfaces and although it includes dune ridges and swales, they are poorly developed (Crenwelge et al. 1988). These soils are a mixture of wind and washover deposits of slightly coarser sands. The water table is close to and occasionally at the surface of these soils; normally 25.4 cm (10 in) to 76.2 cm (30 in) in depth (Crenwelge et al. 1988). Vegeta-

tion composition within the Mustang Soil region changes considerably with surface slope and configuration. The water table elevation follows surface topography and so lies at different elevations throughout the Park (Lambert 1998). Topographical changes control depth to the water table and affect soil alkalinity, drainage, and permeability. Therefore, even very slight topographical and slope changes result in markedly different plant communities. Concave surfaces contain what Texas' Natural Heritage Program (1993) termed a "Gulf Cordgrass Series" grassland dominated by *Spartina spartinae* and *S. patens*, while convex surfaces support strand prairie.

Nass Very Fine Sandy Loam Series soils are neutral to moderately alkaline soils in non-tidal swales and occur as inclusions in each of the three prairie soil types. The water table extends to or above the soil surface in most years and a permanent water table lies within 15.2 cm (6 in) to 70 cm (24 in) of the surface (Crenwelge et al. 1988). They are the remainder of lagoons formed as the Island accreted seaward and offshore bars accumulated sand, rising to form new dune ridges parallel to the beach. The older swales have been broken by overwash deposition and wind erosion into strings of circular, freshwater ponds up to 1.8 m (6 ft) in depth. These are often surmounted by crescent-shaped dunes along leeward sides that may contain small live oak mottes.

Resource Management

Resource management at the park strives to conserve and restore its pre-European settlement landscape, and terrestrial and aquatic plant and wildlife communities. Prior to becoming a State Park in 1972 the site had been intensively grazed by fenced cattle, greatly reducing the dominance of tall grasses such as little bluestem (*Schizachyrium scoparium*) that are typical of strand prairie (Keith 2005). In addition, much of the park had been invaded by non-native plants including Chinese tallow-tree (*Triadica sebifera*) and Japanese honeysuckle (*Lonicera japonica*). Mowing, mechanical chipping, herbicide, and prescribed fire have been used to almost eliminate these species and slowly increase those described as dominants in strand prairie.

Prescribed and wildfires have been documented in the park since 1976 (Creacy 2007). Between 1976 and 2006, when a more rigorous prescribed fire program was implemented, 11 fires burned a total of 985.8 ha (2,436 acres), mostly within the 356.1 ha (880 acres) containing strand prairie and gulf cordgrass plant communities though the results were poorly documented. Since 2006 prescribed fires applied to the prairies have been better documented including the use of permanent vegetation plots for effects monitoring. The entire prairie area of the park has been burned at least once during the 2007 to present time period.

Present resource management includes the continued use of prescribed fire to burn the prairies on an approximate 3 to 7 year rotation as well as spot treatment of non-native, invasive plant species including Guinea grass (*Megathyrsus maximus*), Chinese tallow-tree, Vasey grass (*Paspalum urvillei*), black locust (*Robinia pseudoacacia*), cabbage palm (*Sabal palmetto*), and Mexican fan palm (*Washingtonia robusta*). Mechanical treatments are no longer used as it is thought to spread invasive species into the prairies, and they have been made unnecessary by the more rigorous use of prescribed fires.

Other management activities include the propagation and planting of species that are uncommon or absent from the park's prairies, but are common to strand prairie on an unfenced reference site on the adjacent barrier island just south of Galveston. Indeed, a focus on the restoration of the park's prairies revealed the need for an intensive baseline inventory of vascular plant species that occurred there. Raymond J. Fleetwood, a U.S. Fish & Wildlife Service biologist who worked on the Texas coast beginning in the 1960s, performed what was probably the first and only effort to survey the vascular plants at Galveston Island State Park, compiling a list comprising 108 species distributed in 96 genera and 39 families (Fleetwood 1973). Fleetwood also vouchered a modest exsiccatae of 63 specimens at the University of Texas at Austin Plant Resources Center Herbarium (TEX). Interest in restoring the park's prairie flora and continuing the work that Fleetwood began four decades ago has culminated in the study reported here.

METHODS

Twenty collecting trips were made to the park from July 2011 through November 2013, and in all months except December–February. A complete set of voucher specimens is housed at TEX. Plant identifications were

Table 1. Taxonomic summary of vascular plants of Galveston Island State Park, Galveston County, Texas.

	Families	Genera	Species		
			Native	Non-native	Total
Monocots	14	67	94	23	117
Eudicots	54	154	171	29	200
Totals	**68**	**221**	**265**	**52**	**317**

primarily made using the appropriate volumes of *Flora of North America* (1993+), Correll and Johnston (1970), and Gould (1975). When practical, infraspecific names were determined. Classification and author names follow Tropicos (2013). Nativity and any special conservation status of each species were determined by review of *Flora of North America* (1993+) and Correll and Johnston (1970). We follow Nesom (2000) in defining non-native species as those originating from a different continent or less commonly in this flora cultivated from outside the geographic extent of the Western Gulf Coastal Plain ecoregion (Griffith et al. 2004).

RESULTS & DISCUSSION

A combination of field work from July 2011 through November 2013 and review of Fleetwood's specimens housed at TEX yielded 317 species of vascular plants representing 68 families and 221 genera (Table 1). The families containing the largest number of species (native and non-native combined) are Poaceae (65 spp.), Asteraceae (36 spp.), Fabaceae (25 spp.), Cyperaceae (24 spp.), and Amaranthaceae (11 spp.). Large genera include *Cyperus* with nine native and one non-native species, and *Juncus* with eight native species. Non-native species account for 16.4% of the total flora. Poaceae included the most non-native species (16). Two families, Arecaceae and Tamaricaceae, are represented by only non-native species. The two Arecaceae species are not known to be invasive in Texas (Nesom 2009), but have begun rapidly reproducing on Galveston Island, likely because of warmer winters (Britton & Morton 1989; National Weather Service 2013), and are a new threat to the prairie habitats. Seven species in six different families are of conservation interest in that they are endemic to the ecoregion.

Plant Communities

No effort was made to quantitatively describe plant communities that occur in the park. However, due to the influence of soil types, wind, wave, tidal action, and sometimes sharp elevation gradients across the landscape, several habitat types are readily identified in the field simply because the resulting species composition is so consistent (Fig. 4, Table 2). We believe we provide nearly complete lists of characteristic species for some habitats (beach, dunes, salt marsh), or at least a list of dominant species (prairie, woodlands). The sea-grass beds in the park are dominated by a two species, *Halodule wrightii* and *Ruppia maritima*. Although a decline and eventual disappearance of sea-grass by the early 1980s was reported for West Galveston Bay (Pulich & White 1991), sea-grass beds are now frequent along the lagoon and bay-shores in Galveston Island State Park (Fig. 4F). To what degree this is the result of past efforts to reintroduce plants, natural recruitment, or both is not known. The park's prairies have the highest species richness (153 spp.) and include five of the seven endemic species we collected (Fig. 4D, Table 2, Appendix). The park's woodlands occur as small stands of trees along natural berms and ridges (e.g., Fig. 4G).

Endemics and Species of Conservation Interest

Seven endemic species were documented during field work. *Digitaria arenicola,* a rhizomatous perennial restricted to prairies in the park, is endemic to deep coastal sands of Texas and is mapped by Wipff and Hatch (1994) as seeing its northern-most records from Galveston County. *Digitaria texana* is another sandy-prairie species known only from the Texas' coast and Rio Grande plains (Correll & Johnston 1970). *Gomphrena nealleyi* seems to be of restricted distribution, known from sandy or clayey soils in coastal Texas and the Rio Grande plains and adjacent southwest Texas and Mexico (Correll & Johnston 1970). *Herbertia lahue*, *Tradescantia*

Fig. 4. Representative photos of general habitat types at Galveston Island State Park, Galveston County, Texas. **A.** Beach. **B.** Dunes (seaward aspect). **C.** Dunes (leeward aspect). **D.** Strand prairie. **E.** Salt marsh. **F.** Seagrass bed. **G.** Woodland. **H.** Wetland.

Table 2. Characteristic native species (listed in alphabetical order) of select habitats of Galveston Island State Park, Galveston County, Texas.

Beach	
Amaranthus greggii	*Rayjacksonia phyllocephala* var. *phyllocephala*
Cakile constricta	*Sesuvium portulacastrum*
Cakile geniculata	*Sporobolus virginicus*
Eustoma exaltatum	*Tidestromia lanuginosa* subsp. *lanuginosa*
Fimbristylis castanea	
Dunes (both seaward & leeward)	
Ipomoea imperati	*Rubus trivialis*
Ipomoea pes-caprae subsp. *brasiliensis*	*Spartina patens*
Panicum amarum	*Heterotheca subaxillaris*
Uniola paniculata	*Baptisia bracteata* var. *leucophaea*
Aphanostephus skirrhobasis	*Oenothera drummondii*
Helianthus praecox	*Vigna luteola*
Croton punctatus	
Salt marsh	
Agalinis maritima	*Salicornia bigelovii*
Batis maritima	*Sarcocornia utahensis*
Cuscuta indecora var. *indecora*	*Monanthochloe littoralis*
Iva angustifolia	*Spartina alterniflora*
Iva frutescens	*Spartina spartinae*
Limonium carolinianum	*Spergularia salina*
Lycium carolinianum	*Strophostyles helvola*
Strand Prairie	
Agalinis fasciculata	*Monarda punctata*
Ambrosia psilostachya	*Muhlenbergia capillaries*
Baptisia bracteata var. *leucophaea*	*Oenothera drummondii*
Croton capitatus var. *lindheimeri*	*Panicum virgatum*
Croton glandulosus var. *lindheimeri*	*Paspalum monostachyum*
Dichanthelium scoparium	*Paspalum plicatulum* var. *plicatulum*
Digitaria cognata subsp. *cognata*	*Paspalum setaceum* var. *stramineum*
Eupatorium serotinum	*Physalis cinerascens* var. *spathulifolia*
Euthamia leptocephala	*Schizachyrium scoparium* var. *scoparium*
Fimbristylis caroliniana	*Setaria pumila*
Fimbristylis castanea	*Spartina patens*
Heterotheca subaxillaris	*Spartina spartinae*
Mimosa strigillosa	*Strophostyles leiosperma*
Woodlands	
Baccharis halimifolia	*Paspalum monostachyum*
Campsis radicans	*Quercus nigra*
Celtis laevigata	*Quercus virginiana*
Erythrina herbacea	*Sideroxylon lanuginosum* subsp. *oblongifolium*
Ilex vomitoria	*Smilax bona-nox*
Indigofera suffruticosa	*Vitis mustangensis*
Melothria pendula	*Zanthoxylum clava-herculis*

subacaulis, and *Zephyranthes traubii* are also prairie species endemic to the either primarily the Western Gulf Coastal Plain (in the case of *H. lahue*) or Texas (Correll & Johnston 1970). In the 1970s, Raymond J. Fleetwood discovered a population of "corkwood" he identified as *Leitneria floridana* in forested wetlands in nearby Brazoria County. Recognizing the plants were regionally unique and concerned with the conservation of the population, in 1972, he introduced plants to several suitable sites in the park's prairies (Fleetwood 1973; David Riskind, personal communication). Since then, the donor-site (Bird Pond) has been permanently protected through acquisition by the U.S. Fish & Wildlife Service, and the plants there have been recently described as a new species, *Leitneria pilosa* subsp. *pilosa*, known only from forested wetlands and prairies of the upper Texas Gulf Coast (Schrader & Graves 2011).

A native plant known to have been extirpated from the park has been successfully re-introduced. Sea-oats

(*Uniola paniculata*) from native populations on nearby Follet's Island were established in dunes in the park in 2010. Future efforts to restore the park's strand prairies will continue and include the use of fire as well as local cultivation and reintroduction of species absent, but expected in this community type. Interestingly, *Schizachyrium littorale* does not occur in the park as mapped by Diamond et al. (1987), but rather is replaced by *S. scoparium* var. *scoparium*. The need for protection and floristic inventory of a remnant strand prairie on nearby Follet's Island has also come to light during this study, and steps are being taken to bring this about.

Plant introductions during restoration should first be carefully evaluated. Probably in an effort to improve habitat for migratory songbirds, in about 1990, the non-native black locust (*Robinia pseudoacacia*) was purposefully planted in the park's woodlands or in stands to create new-woodlands. This species has since become invasive and required control.

APPENDIX

ANNOTATED CHECKLIST OF VASCULAR PLANTS AT GALVESTON ISLAND STATE PARK

Families are arranged alphabetically, beginning with monocots and followed by eudicots. Genera, species, and infraspecific names are arranged alphabetically under families. Some species names are preceded by special symbols to indicate nativity and conservation interest as follows: (1) non-native species are indicated by an asterisk (*) based on review of Correll and Johnston (1970); (2) endemic species are indicated by a superscript dagger (†) based on review of *Flora of North America* (1993+) and Correll and Johnston (1970). Following each name is an abbreviation from Palmer et al. (1995) representing one of the following subjective estimates of the relative abundance of that species in the particular habitat(s) where it was collected: **r** = rare (very difficult to find and limited to one or very few locations or uncommon habitats); **i** = infrequent (difficult to find with few individuals or colonies but found in several locations); **o** = occasional (widely scattered but not difficult to find); **f** = frequent (easily seen or found in one or more common habitats but not dominant in any common habitat); and **a** = abundant (dominant or co-dominant in one or more common habitats; terms in quotes are those of Fleetwood). Following the relative abundance, the habitat(s) where that species is typically found is indicated by the following general categories (terms in quotes are those of Fleetwood): **beach** = from the wave swash zone to the base of the dunes; **dunes** (both seaward and leeward) = vegetation stabilized wind deposited mounds and ridges that parallel the beach; **prairie** = grasslands throughout the park; **woodlands** = thickets of woody species; **wetlands** = all non-tidal freshwater wetlands including seasonally flooded ponds and swales; **salt marsh** = wetlands with rare to daily tidal flooding dominated by halophytic vascular plants; **sea-grass beds** = stands of rooted aquatic vascular plants that occur in shallow waters of the bay and lagoons; **disturbed** = dirt roads, roadside ditches, fence-lines, campgrounds, and vicinity of man-made structures. Collections are the first authors with the exceptions of two without number (*s.n.*) by the third author and those of Fleetwood (RJF) or William R. Carr (WRC).

MONOCOTS

Alismataceae
Sagittaria longiloba Engelm. ex J.G. Sm., **r**, wetland, 5592

Amaryllidaceae
Allium canadense L. var. *mobilense* (Regel) Ownbey, **i**, prairie, 5997
Nothoscordum bivalve (L.) Britton, **o**, disturbed, 5959
†*Zephyranthes traubii* (W. Hayw.) Moldenke, **o**, prairie, 6109

Arecaceae
Sabal palmetto* (Walter) Lodd. ex Schult. & Schult. f., **o, prairie, 6113
Washingtonia robusta* H. Wendl., **o, disturbed, woodland 6137

Asparagaceae
Yucca flaccida Haw., **r**, prairie, 6140

Commelinaceae
Commelina erecta L. var. *angustifolia* (Michx.) Fernald, **r**, prairie, 5488
Tradescantia occidentalis (Britton) Smyth, **o**, disturbed, 5976
Tradescantia ohiensis Raf., **o**, prairie, 5553
†*Tradescantia subacaulis* Bush, **i**, prairie, 5938

Cymodoceaceae
Halodule wrightii Asch., **a**, seagrass beds, 6119

Cyperaceae
Carex longii Mack. **o**, wetland, 5982
Cyperus acuminatus Torr. & Hook., **r**, prairie, 6148
Cyperus croceus Vahl, **r**, prairie, 5760
Cyperus esculentus* L., **r, prairie, 5489
Cyperus odoratus L. var. *odoratus*, **r**, wetland, 5910
Cyperus polystachyos Rottb., **o**, prairie, wetland, 5576
Cyperus pseudovegetus Steud., **o**, wetland, 5759
Cyperus retrorsus Chapm., **o**, prairie, 5254
Cyperus strigosus L., "disturbed", RJF 10,912
Cyperus surinamensis Rottb., **o**, disturbed, 6094
Cyperus virens Michx. var. *virens*, **f**, wetland, 5756
Eleocharis albida Torr., **o**, prairie, wetland, 5993

Eleocharis ambigens Fernald, **r**, wetland, 6133
Eleocharis montevidensis Kunth, **o**, prairie, wetland, 5599
Eleocharis palustris (L.) Roem. & Schult., **o**, wetland, 5594
Fimbristylis caroliniana (Lam.) Fernald, **o**, prairie, 5494
Fimbristylis castanea (Michx.) Vahl, **f**, beach, prairie, 5300
Isolepis carinata* Hook. & Arn. ex Torr., **r, prairie, 5558
Isolepis cernua* (Vahl) Roem. & Schult., **o, prairie, 5602
Kyllinga brevifolia* Rottb., **o, disturbed, 6066
Rhynchospora colorata (L.) H. Pfeiff., **o**, prairie, 6075
Schoenoplectus americanus (Pers.) Volkart ex Schinz & R. Keller, **o**, wetland, 5590
Schoenoplectus californicus (C.A. Mey.) Soják, **a**, wetland, 6013
Schoenoplectus pungens (Vahl) Palla, **f**, prairie, wetland, 5995

Iridaceae

†*Herbertia lahue* (Molina) Goldblatt, **l**, prairie, 5989
Sisyrinchium biforme E.P. Bicknell, **r**, prairie, 5581
Sisyrinchium exile* E.P. Bicknell, **r, prairie, 5578
Sisyrinchium langloisii Greene, **o**, prairie, 5941

Juncaceae

Juncus acuminatus Michx., **o**, prairie, 5981
Juncus brachycarpus Engelm., **o**, prairie, 6016
Juncus dichotomus Elliott, **o**, prairie, 5992
Juncus marginatus Rostk., **o**, prairie, 5567
Juncus megacephalus M.A. Curtis, **o**, wetland, 5755
Juncus roemerianus Scheele, **f**, wetland, 5572
Juncus validus Coville var. *fascinatus* M.C. Johnst., **o**, wetland, 5754
Juncus validus Coville var. *validus*, **o**, wetland, 5762

Lemnaceae

Lemna minuta Kunth, **a**, wetland, 6014

Poaceae

Agrostis hyemalis (Walter) Britton, Sterns & Poggenb., **o**, prairie, 5988
Andropogon glomeratus (Walter) Britton, Sterns & Poggenb., **r**, wetland, 5916
Andropogon virginicus L., **o**, prairie, 5498
Aristida purpurascens Poir., **i**, prairie, s.n.
Arundo donax* L., **f, wetland, 6139
Axonopus fissifolius (Raddi) Kuhlm., "abundant, grassland", RJF 10,507
Bothriochloa ischaemum* (L.) Keng, **o, disturbed, 6136
Briza minor* L., **f, disturbed, 5974
Cenchrus spinifex Cav., **i**, disturbed, 6070
Cynodon dactylon* (L.) Pers., **o, disturbed, 5969
**Dactyloctenium aegyptium* (L.) Willd., "occasional, disturbed", RJF 10,542
Dichanthelium acuminatum (Sw.) Gould & C.A. Clark, **o**, prairie, 6015
Dichanthelium laxiflorum (Lam.) Gould, **o**, prairie, 5568
Dichanthelium scoparium (Lam.) Gould, **o**, prairie, 5274
Dichanthelium sphaerocarpon (Elliott) Gould "occasional, dunes, wetlands", RJF 10,813
†*Digitaria arenicola* (Swallen) Beetle, **i**, prairie, 6086
Digitaria ciliaris* (Retz.) Koeler var. *ciliaris*, **o, prairie, 5285
Digitaria cognata (Schult.) Pilg. subsp. *cognata*, **o**, prairie, 5487
†*Digitaria texana* Hitchc., **r**, prairie, 6151
Echinochloa walteri (Pursh) A. Heller, **o**, wetland, 5593
Elymus virginicus L., **i**, prairie, 6040
Eragrostis elliottii S. Watson, **o**, prairie, 5497
Eragrostis secundiflora J. Presl, **r**, prairie, 5919
Eragrostis silveana Swallen, **r**, prairie, 6152
Eustachys petraea (Sw.) Desv., **o**, prairie, 5996
Hordeum pusillum Nutt., **f**, disturbed, 5967
Leptochloa fusca (L.) Kunth subsp. *uninervia* (J. Presl) N.W. Snow, **r**, wetland, 5266
Leptochloa nealleyi Vasey, **f**, wetland, 5289
Limnodea arkansana (Nutt.) L.H. Dewey, **i**, woodland, 6003
**Lolium arundinaceum* (Schreb.) Darbysh., "infrequent, grassland", RJF 10,513
Lolium perenne* L., **o, disturbed, 6029
Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs, **r, prairie, 5485
Monanthochloe littoralis Engelm., **a**, salt marsh, 5957
Muhlenbergia capillaris (Lam.) Trin., **o**, prairie, 5491
Panicum amarum Elliott, **f**, dunes, 6145
Panicum dichotomiflorum Michx., **f**, wetland, 6150
Panicum repens* L., **o, beach, 6091
Panicum virgatum L., **o**, prairie, 5298
Parapholis incurva* (L.) C.E. Hubb., **o, saltmarsh, 5964
Paspalidium geminatum* (Forssk.) Stapf var. *geminatum*, **f, wetland, 6131
Paspalum monostachyum Vasey, **o**, prairie, woodlands, 5495
Paspalum plicatulum Michx. var. *plicatulum*, "common", prairie, RJF 10,541
Paspalum setaceum Michx. var. *stramineum* (Nash) D.J. Banks, **o**, prairie, 5492
Paspalum urvillei* Steud., **o, prairie, 6078
Paspalum vaginatum Sw., **a**, wetland, 5265
Phalaris angusta Nees ex Trin., **i**, prairie, 5944
Phalaris caroliniana Walter, **o**, prairie, 5561
Phragmites australis (Cav.) Trin. ex Steud., **f**, wetland, 6146
Poa annua* L., **o, prairie, disturbed, 5937
Polypogon monspeliensis* (L.) Desf., **f, saltmarsh, 5963
Sacciolepis striata (L.) Nash, **o**, wetland, 5915
Schizachyrium scoparium (Michx.) Nash var. *scoparium*, **f**, prairie, 5490
Setaria magna Griseb., **f**, wetland, 5301
Setaria parviflora (Poir.) Kerguélen, **o**, prairie, 5598
Setaria pumila (Poir.) Roem. & Schult., **f**, prairie, 5261
Sorghum halepense* (L.) Pers., **o, disturbed, 6116
Spartina alterniflora Loisel., **a**, saltmarsh, 6123
Spartina patens (Aiton) Muhl., **a**, dunes, prairie, 5257
Spartina spartinae (Trin.) Merr. ex Hitchc., **f**, prairie, saltmarsh, 5589
Sphenopholis obtusata (Michx.) Scribn., **o**, prairie, 5559
Sporobolus virginicus (L.) Kunth, **o**, wetland, beach, 5911
Tridens strictus (Nutt.) Nash, **i**, prairie, s.n.
Tripsacum dactyloides (L.) L., **r**, prairie, 6041
Uniola paniculata L., **r**, dunes, 6144
Vulpia octoflora (Walter) Rydb. var. *octoflora*, **o**, prairie, 5575

Ruppiaceae

Ruppia maritima L., **o**, seagrass beds, wetland, 5971

Smilacaceae

Smilax bona-nox L., **o**, woodland, 6127

Typhaceae

Typha latifolia L., **r**, wetland, 5299

EUDICOTS

Adoxaceae

Sambucus nigra L. subsp. *canadensis* (L.) Bolli, **i**, prairie, 6042

Aizoaceae

Sesuvium maritimum (Walter) Britton, Sterns & Poggenb., **f**, wetland, 5268
Sesuvium portulacastrum (L.) L., **f**, beach, 5934

Amaranthaceae

Alternanthera philoxeroides* (Mart.) Griseb., **f, wetland, 5927
Amaranthus greggii S. Watson, **f**, beach, 6087

*?*Amaranthus spinosus* L., "disturbed", RJF 10,530
Chenopodium album* L., **r, prairie, 5311
Dysphania ambrosioides* (L.) Mosyakin & Clemants, **f, prairie, 5409
†*Gomphrena nealleyi* J.M. Coult. & Fisher, **o**, prairie, 6110
Gomphrena serrata L., **i**, prairie, 6024
Salicornia bigelovii Torr., **a**, salt marsh, 6114
Sarcocornia utahensis (Tidestr.) A.J. Scott, **a**, salt marsh, 6064
Suaeda linearis (Elliott) Moq., **r**, wetland, 5303
Tidestromia lanuginosa (Nutt.) Standl. subsp. *lanuginosa*, **o**, beach, 6103

Apiaceae
Ammoselinum butleri (Engelm. ex S. Watson) J.M. Coult. & Rose, **o**, prairie, 5951
Chaerophyllum tainturieri Hook. var. *tainturieri*, **o**, disturbed, prairie, 5940
Cyclospermum leptophyllum (Pers.) Sprague, **o**, prairie, 5603
Limnosciadium pinnatum (DC.) Mathias & Constance, **o**, prairie, 5586
Limnosciadium pumilum (Engelm. & A. Gray) Mathias & Constance, **f**, prairie, 5962

Apocynaceae
Cynanchum angustifolium Pers., **o**, wetland, 5295

Aquifoliaceae
Ilex vomitoria Aiton, **i**, woodland, 6028

Araliaceae
Hydrocotyle bonariensis Lam., **o**, wetland, 5752

Asteraceae
Ambrosia psilostachya DC., **o**, prairie, 6134
Ambrosia trifida L. var. *texana* Scheele, **o**, woodland, 6134
Aphanostephus skirrhobasis (DC.) Trel. ex Coville & Branner, **o**, dunes, 5929
Baccharis halimifolia L., **f**, woodland, 6128
Borrichia frutescens (L.) DC., **o**, wetland, 5307
Cirsium horridulum Michx. var. *horridulum*, **o**, prairie, 5998
Conoclinium coelestinum (L.) DC., **r**, wetland, 5292
Conyza canadensis (L.) Cronquist, **o**, prairie, 5408
Coreopsis basalis (A. Dietr.) S.F. Blake, **o**, prairie, 6022
Coreopsis tinctoria Nutt., **r**, prairie, 5749
Eclipta prostrata (L.) L., **r**, wetland, 5286
Erigeron procumbens (Houst. ex Mill.) G.L. Nesom, **i**, prairie, 5746
Eupatorium capillifolium (Lam.) Small ex Porter & Britton, **o**, prairie, 6130
Eupatorium serotinum Michx., **f**, prairie, 5407
Euthamia gymnospermoides Greene, "common, grassland", WRC 10,187
Euthamia leptocephala (Torr. & A. Gray) Greene ex Porter & Britton, **a**, prairie, 5499
Gaillardia pulchella Foug., **o**, prairie, 5277
Helenium amarum (Raf.) H. Rock, **r**, prairie, 5417
Helianthus petiolaris Nutt. subsp. *petiolaris*, **o**, prairie, 5255
Helianthus praecox Engelm. & A. Gray, **f**, dunes, 6076
Heterotheca subaxillaris (Lam.) Britton & Rusby, **o**, dunes, prairie, 5753
Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera, **i, disturbed, 6020
Iva angustifolia Nutt. ex DC., **o**, saltmarsh, 6124
Iva frutescens L., **f**, saltmarsh, 5269
Krigia wrightii (A. Gray) K.L. Chambers ex K.J. Kim, **r**, disturbed, 5958
Mikania scandens (L.) Willd., **o**, wetland, 5291
Pluchea odorata (L.) Cassini var. *odorata*, **o**, wetland, 5259
Pseudognaphalium obtusifolium (L.) Hilliard & B.L. Burtt, **o**, prairie, 5555
Pyrrhopappus carolinianus (Walter) DC., **r**, prairie, 5748
Rayjacksonia phyllocephala (DC.) R.L. Hartm. & M.A. Lane var. *phyllocephala*, **a**, beach, 5932
Rudbeckia hirta L., **o**, prairie, 5552
Solidago sempervirens L., **o**, prairie, 5420
Soliva sessilis Ruiz & Pav., **f**, disturbed, 6025
Sonchus asper* (L.) Hill, **i, prairie, 6023
Sonchus oleraceus* L., **i, disturbed, 5961
Symphyotrichum subulatum (Michx.) G.L. Nesom, **o**, prairie, 5914

Bataceae
Batis maritima L., **a**, saltmarsh, 5305

Bignoniaceae
Campsis radicans (L.) Bureau, **o**, woodland, 6072

Boraginaceae
Heliotropium curassavicum L. var. *curassavicum*, **f**, wetland, 5288
Nama jamaicensis L., "disturbed", RJF 10,905

Brassicaceae
Cakile constricta Rodman, **f**, beach, 6031
Cakile geniculata (B.L. Rob.) Millsp., **f**, beach, 6032
Lepidium virginicum L. var. *virginicum*, **o**, prairie, 5587

Cactaceae
Opuntia humifusa (Raf.) Raf. var. *humifusa*, **o**, prairie, woodland, 6096

Campanulaceae
Triodanis biflora (Ruiz & Pav.) Greene, **o**, prairie, 5556

Cannabaceae
Celtis laevigata Willd., **o**, woodland, 6007

Caprifoliaceae
Lonicera japonica* Thunb, **o, woodland, 5985
Valerianella woodsiana (Torr. & A. Gray) Walp., RJF 10,908

Caryophyllaceae
Cerastium glomeratum Thuill., **o**, prairie, 5936
**Polycarpon tetraphyllum* (L.) L., "disturbed", RJF 10,922
**Silene gallica* L., "disturbed", RJF 10,888
Spergularia salina J. Presl & C. Presl, **o**, saltmarsh, 5965
Stellaria media (L.) Vill., **o**, prairie, 5953

Celastraceae
Lepuropetalon spathulatum Muhl. ex Elliott, **o**, prairie, 5573

Cistaceae
Helianthemum rosmarinifolium Pursh, **o**, prairie, 6125
Lechea mucronata Raf., **r**, prairie, 5912

Convolvulaceae
Calystegia sepium (L.) R. Br. subsp. *limnophila* (Greene) Brummitt, **o**, disturbed, 6034
Cuscuta indecora Choisy var. *indecora*, **o**, saltmarsh (on *Iva frutescens*), 6118
Dichondra carolinensis Michx., **o**, prairie, 5973
Ipomoea cordatotriloba Dennst. var. *cordatotriloba*, **i**, prairie, 6112
Ipomoea imperati (Vahl) Griseb., **f**, dunes, 6033
Ipomoea pes-caprae (L.) R. Br. subsp. *brasiliensis* (L.) Ooststr., **f**, dunes, 6090
Ipomoea sagittata Poir., **f**, wetland, 5302

Cucurbitaceae
Ibervillea lindheimeri (A. Gray) Greene, "occasional, disturbed", RJF 10,539
Melothria pendula L., **o**, woodland, 6147

Euphorbiaceae
Chamaesyce maculata* (L.) Small, **o, prairie, 5284
Chamaesyce nutans* (Lag.) Small, **o, disturbed, 6143

Croton capitatus Michx. var. lindheimeri (Engelm. & A. Gray) Müll. Arg., **o**, prairie, 5922
Croton glandulosus L. var. *lindheimeri* Müll. Arg., **f**, prairie, 5256
Croton punctatus Jacq., **f**, dunes, 6077
Triadica sebifera* (L.) Small, **o, woodland, 6126

Fabaceae
Acacia farnesiana (L.) Willd., **o**, prairie, 5983
Aeschynomene indica* L., **r, wetland, 5414
Astragalus leptocarpus Torr. & A. Gray, **i**, prairie, 5949
Baptisia bracteata Muhl. ex Elliott var. *leucophaea* (Nutt.) Kartesz & Gandhi, **f**, dunes, prairie, 5580
Centrosema virginianum (L.) Benth., **r**, prairie, 5418
Chamaecrista fasciculata (Michx.) Greene, **o**, prairie, 5406
Erythrina herbacea L., **f**, woodland, 5984
Glottidium vesicarium* (Jacq.) R.M. Harper, **r, prairie, 5496
Indigofera miniata Ortega, **i**, prairie, 6035
Indigofera suffruticosa Mill., **o**, woodland, 6129
Leucaena leucocephala* (Lam.) de Wit, **o, woodland, 6121
Medicago polymorpha* L., **o, disturbed, 5977
Melilotus indicus* (L.) All., **r, prairie, 5994
Mimosa strigillosa Torr. & A. Gray, **o**, prairie, 5278
Pediomelum rhombifolium (Torr. & A. Gray) Rydb., "infrequent, disturbed", RJF 10,535
Rhynchosia americana (Mill.) Metz, **o**, prairie, 6071
Robinia pseudoacacia* L., **i, woodland, 6074
Sesbania drummondii (Rydb.) Cory, **o**, wetland, 5294
Strophostyles helvola (L.) Elliott, **f**, prairie, slatmarsh, 6117
Strophostyles leiosperma (Torr. & A. Gray) Piper, **f**, prairie, 5262
Tephrosia onobrychoides Nutt., **r**, prairie, 5744
Trifolium carolinianum Michx., **i**, disturbed, 5991
Vicia ludoviciana Nutt. ex Torr. & A. Gray, **o**, disturbed, 5972
Vicia minutiflora D. Dietr., **o**, prairie, 5948
Vigna luteola (Jacq.) Benth., **f**, wetland, dunes, 5283

Fagaceae
Quercus nigra L., **i**, woodland, 6011
Quercus virginiana Mill., **f**, woodland, 6008

Gentianaceae
Centaurium pulchellum* (Sw.) Druce, **r, disturbed, 5966
Eustoma exaltatum (L.) Salisb. ex G. Don, **r**, beach, prairie, 5419
Sabatia campestris Nutt., **r**, prairie, 5579

Geraniaceae
Geranium carolinianum L., **f**, prairie, 5952
Geranium texanum (Trel.) A. Heller, **o**, prairie, 5577

Hypericaceae
Hypericum drummondii (Grev. & Hook.) Torr. & A. Gray, **o**, prairie, 5921

Lamiaceae
Monarda punctata L., **o**, prairie, 5583
Scutellaria parvula Michx., **o**, woodland, 6073
Teucrium canadense L., **f**, prairie, 5272

Linaceae
Linum medium (Planch.) Britton var. *texanum* (Planch.) Fernald, **o**, prairie, 5750

Malvaceae
Callirhoe involucrata (Torr. & A. Gray) A. Gray var. *lineariloba* (Torr. & A. Gray) A. Gray, "disturbed", RJF 10,926
Hibiscus laevis All., **i**, wetland, 6095
Kosteletskya virginica C. Presl, **f**, wetland, 5263
Sida ciliaris L., **o**, prairie, 6079
Sida rhombifolia L., **o**, disturbed, 6005

Melastomataceae
Rhexia mariana L. var. *mariana*, **o**, prairie, 5745

Myricaceae
Morella cerifera (L.) Small, **i**, prairie, woodlands, 6012

Onagraceae
Gaura filiformis Small, **f**, prairie, 5271
Gaura parviflora Douglas ex Lehm., **i**, prairie, 6027
Ludwigia glandulosa Walter, **o**, wetland, 6081
Ludwigia grandiflora* (Michx.) Greuter & Burdet subsp. *hexapetala* (Hook. & Arn.) G.L. Nesom & Kartesz, **o, wetland, 6082
Ludwigia linearis Walter, **o**, wetland, 5758
Ludwigia repens J.R. Forst., **o**, wetland, 6065
Oenothera drummondii Hook., **f**, dunes, prairie, 5751
Oenothera laciniata Hill, **o**, prairie, 5970
Oenothera speciosa Nutt., **f**, prairie, 5956

Orobanchaceae
Agalinis fasciculata (Elliott) Raf., **f**, prairie, 5276
Agalinis heterophylla (Nutt.) Small, **i**, prairie, 6141
Agalinis maritima (Raf.) Raf., **o**, salt marsh, 6069
Buchnera americana L., **r**, prairie, 6111

Oxalidaceae
Oxalis corniculata* L., **o, prairie, 5943
Oxalis violacea L., **r**, disturbed, 5918

Phytolaccaceae
Phytolacca americana L., **o**, prairie, 5282

Plantaginaceae
Bacopa monnieri (L.) Wettst., **f**, wetland, 5267
Callitriche peploides Nutt., **r**, wetland, 5597
Callitriche terrestris Raf., **o**, wetland, 5596
Nuttallanthus texanus (Scheele) D.A. Sutton, **o**, prairie, 5584
Plantago hookeriana Fisch. & C.A. Mey., "disturbed", RJF 10,904
Plantago virginica L., **f**, disturbed, 5968

Plumbaginaceae
Limonium carolinianum (Walter) Britton, **o**, saltmarsh, 5913

Polygalaceae
Polygala verticillata L., **o**, prairie, 5588

Polygonaceae
Persicaria hydropiperoides (Michx.) Small, "common, wetland", RJF 10,527
Persicaria punctata (Elliott) Small, **f**, wetland, 5591
Rumex crispus L., **o**, wetland, 5978
Rumex hastatulus Baldwin, **o**, prairie, 5582
Rumex verticillatus L., **i**, wetland, 5945

Polypremaceae
Polypremum procumbens L., **r**, prairie, 5920

Portulacaceae
Portulaca oleracea* L., **o, disturbed, 6068
Portulaca pilosa L., **o**, disturbed, 6108

Primulaceae
Anagallis arvensis L., **o**, prairie, 5605
Anagallis minima (L.) E.H.L. Krause, **r**, prairie, 5557
Samolus ebracteatus Kunth, **o**, prairie, 6000

Ranunculaceae
Ranunculus muricatus L., **o**, disturbed, 5980
Ranunculus pusillus Poir., **f**, wetland, 5595

Rosaceae
Rubus trivialis Michx., **f**, dunes, 5924

Rubiaceae
Diodia teres Walter, **o**, prairie, 5923
Diodia virginiana L., **o**, wetland, 5296
Galium aparine L., **o**, disturbed, prairie, 5955
Galium tinctorium L., **f**, wetland, 5597
Galium uniflorum Michx., "common, wetlands", RJF 10,510
Oldenlandia uniflora L., **r**, prairie, 5747

Rutaceae
Zanthoxylum clava-herculis L., **f**, woodland, 5987

Salicaceae
Salix nigra Marshall, **i**, wetland, 6083

Sapotaceae
Sideroxylon lanuginosum Michx. subsp. *oblongifolium* (Nutt.) T.D. Penn., **o**, woodland, 6122

Simaroubaceae
†*Leitneria pilosa* J.A. Schrad. & W.R. Graves subsp. *pilosa*, **i**, wetland, 6138

Solanaceae
Lycium carolinianum Walter, **a**, salt marsh, 6149
Physalis angulata L. var. *angulata*, **r**, wetland, 5297
Physalis cinerascens (Dunal) Hitchc. var. *spathulifolia* (Torr.) J.R. Sullivan, **o**, prairie, 6085
Physalis pubescens L. var. *pubescens*, **o**, wetland, 5306
Solanum ptychanthum Dunal, **r**, prairie, 5304

Tamaricaceae
Tamarix ramosissima* Ledeb., **f, wetland, 5933

Urticaceae
Urtica chamaedryoides Pursh, "wetlands", RJF 10,818

Verbenaceae
Lantana camara* L., **o, prairie, 5281
Phyla lanceolata (Michx.) Greene, **f**, wetland, 5975
Phyla nodiflora (L.) Greene, "common", RJF 10,532
Verbena halei Small, **o**, prairie, 5942
Verbena brasiliensis* Vell., **o, disturbed, 6010

Vitaceae
Ampelopsis arborea (L.) Koehne, **r**, prairie, 5412
Cissus incisa Des Moul., **o**, wetland, 5413
Vitis mustangensis Buckley, **o**, woodland, 5986

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